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U. S. NAVAL PROVING GROUND  
DAHLGREN, VIRGINIA

REPORT NO. (218)

AVIATION ORDNANCE BLAST PROGRAM  
INVESTIGATION OF  
ROCKET BLAST CHARACTERISTICS

Part 1  
Partial  
Report

Task  
Assignment NPG-20-Re8b-112-1

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U.S. NAVAL PROVING GROUND, DAHLGREN, VA. (NPG REPORT NO. 218)

FOURTH PARTIAL REPORT ON AVIATION ORDNANCE BLAST PROGRAM  
INVESTIGATION OF ROCKET BLAST CHARACTERISTICS - AND APPENDIXES  
A-F

LOG. HANDL (SUBMITTER) 4 FEB '49 11PP. PHOTOS, TABLES

ORDNANCE AND ARMAMENT (22) ROCKETS, AIRCRAFT  
ROCKETS AND LAUNCHERS (10) ROCKETS, BLAST  
ROCKET EXHAUST - EFFECT ON STRUCTURES

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Aviation Ordnance Blast Program  
Investigation of Rocket Blast Characteristics

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PART A

SYNOPSIS

1. This is the fourth partial report on Aviation Ordnance Blast Program-Investigation of Rocket Blast Characteristics conducted under Task Assignment NPG-20-Re8b-116-1.

2. A total of fifty-one (51) five-inch (5"0) spin stabilized rocket motors were fired statically in this phase of the project to determine instantaneous temperatures around the rocket motor blast. Small spectroscopic photographs of the rocket motor blast were taken to reveal dominant spectral lines present which might be utilized for velocity measurements. The optical transmissivity of the rocket motor blast was taken to determine the emissive "grayness" of the blast so the flame temperatures can be taken with an electro-optical pyrometer now under construction. The data obtained are being compiled by Naval Gun Factory personnel.

3. This project will be continued when the Naval Gun Factory personnel return with additional instrumentation installed in the mobile laboratory.

Aviation Ordnance Blast Program  
Investigation of Rocket Blast Characteristics

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PART B

INTRODUCTION

1. AUTHORITY:

This project was directed by references (a) and (b) and authorized by reference (b), which established Task Assignment No. NPG-20-Re8b-116-1.

2. REFERENCES:

- a. BuOrd conf. ltr. S78-1(119)(Re2c) dated 25 April 1946.
- b. BuOrd ltr. NP9(Re8b) dated 5 December 1947.
- c. NPG conf. ltr. F1-5(R80081) dated 16 January 1948.
- d. NPG conf. ltr. F1-5 (R80183) dated 2 March 1948.
- e. NPG conf. Report No. 32 dated 19 May 1948.

3. BACKGROUND:

a. As part of a program to investigate the problems encountered when mounting rocket tubes or recoilless guns internally in aircraft, the Bureau of Ordnance directed the Naval Gun Factory and the Naval Proving Ground to undertake a joint project to procure fundamental data on the physical characteristics of exhaust gases from a rocket or recoilless gun.

b. The Naval Gun Factory is furnishing and operating the required instrumentation. The Naval Proving Ground is providing the necessary facilities and assistance as requested by the Naval Gun Factory. References (c) and (d) are previous partial reports of this test.

4. OBJECT OF TEST:

This project is being conducted to study the characteristics of emergent gases of rockets as to pressures, temperatures, velocities, vibration frequencies, radiated energy, shock wave phenomena, and products of combustion (gas and dust analysis).

Aviation Ordnance Blast Program  
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## 5. PERIOD OF TEST:

a. Date Project Letter	5 December 1947
b. Date Necessary Material received	5 November 1948
c. Date Commenced Test	9 November 1948
d. Awaiting Completion of Instrumentation in the Mobile Laboratory	10 December 1948
e. First Partial Report Submitted	2 March 1948
f. Second Partial Report Submitted	19 May 1948

## 6. REPRESENTATIVES PRESENT:

Mr. R. J. Wylda,	Naval Gun Factory
Mr. W. G. Tang,	Naval Gun Factory
Mr. S. O. Cohen,	Naval Gun Factory
Mr. T. F. Nolin,	Naval Gun Factory
Mr. Robinowitz,	Naval Gun Factory

PART CDETAILS OF TEST

## 7. DESCRIPTION OF ITEM UNDER TEST:

This phase of the project was performed to determine the instantaneous air temperature surrounding the five-inch (5"0) spin stabilized rocket motor blast during firing. Spectroscopic photographs were taken of the rocket motor blast. These will permit analyzation of the light produced by the rocket motor and reveal what dominant spectral lines can then be utilized for velocity measurements based on an optical Doppler effect. The optical transmissivity of the rocket motor blast was determined by using a narrow-beam spotlight and recording photometer.

Aviation Ordnance Blast Program  
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8. DESCRIPTION OF TEST EQUIPMENT:

The equipment provided consisted of twelve (12) resistance type air temperature gages with associated bridges and oscillographic recorders, a portable prism-type Spectrograph, a narrow-beam spotlight and recording photometer for measuring transmissivity and a dynamometer stand for mounting the five-inch (5"0) rocket motors. Appendix (A) shows the stands for air temperature gages relative to the dynamometer stand with rocket motor mounted.

9. PROCEDURE:

Five-inch (5"0) spin stabilized rocket motors were mounted in the dynamometer stand and fired by remote control. Twelve (12) stands with resistance type air temperature gages were spaced around the rocket motor blast, a portable prism-type Spectrograph was installed at various positions relative to the rocket motors, and the narrow beam spotlight and recording photometer were positioned near the rocket motors so that the spotlight beam passed through the blast. The ignition and burning of the rocket motors fired were normal in all instances. Appendix (B) shows the firing data of the rocket motors.

10. RESULTS AND DISCUSSION:

A total of fifty-one (51) five-inch (5"0) spin stabilized rocket motors were fired in this test. In accordance with paragraph (b) of reference (b) the data obtained are being compiled by Naval Gun Factory personnel.

Aviation Ordnance Blast Program  
Investigation of Rocket Blast Characteristics

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By direction.

NPG REPORT NO. 218

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U. S. NAVAL PROVING GROUND  
DAHLGREN, VIRGINIA

Fourth Partial Report  
on  
Aviation Ordnance Blast Program  
Investigation of  
Rocket Blast Characteristics

Project No.: NPG-20-Re8b-116-1  
Copy No.: 20  
No. of Pages: 6

Date:

**4 FEB 1949**

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NP9 37491 - Rear view of Dynamometer Stand showing Twelve  
Mounting Stands for Air Temperature Gauges.

U. S. Naval Proving Ground, Dahlgren, Va.

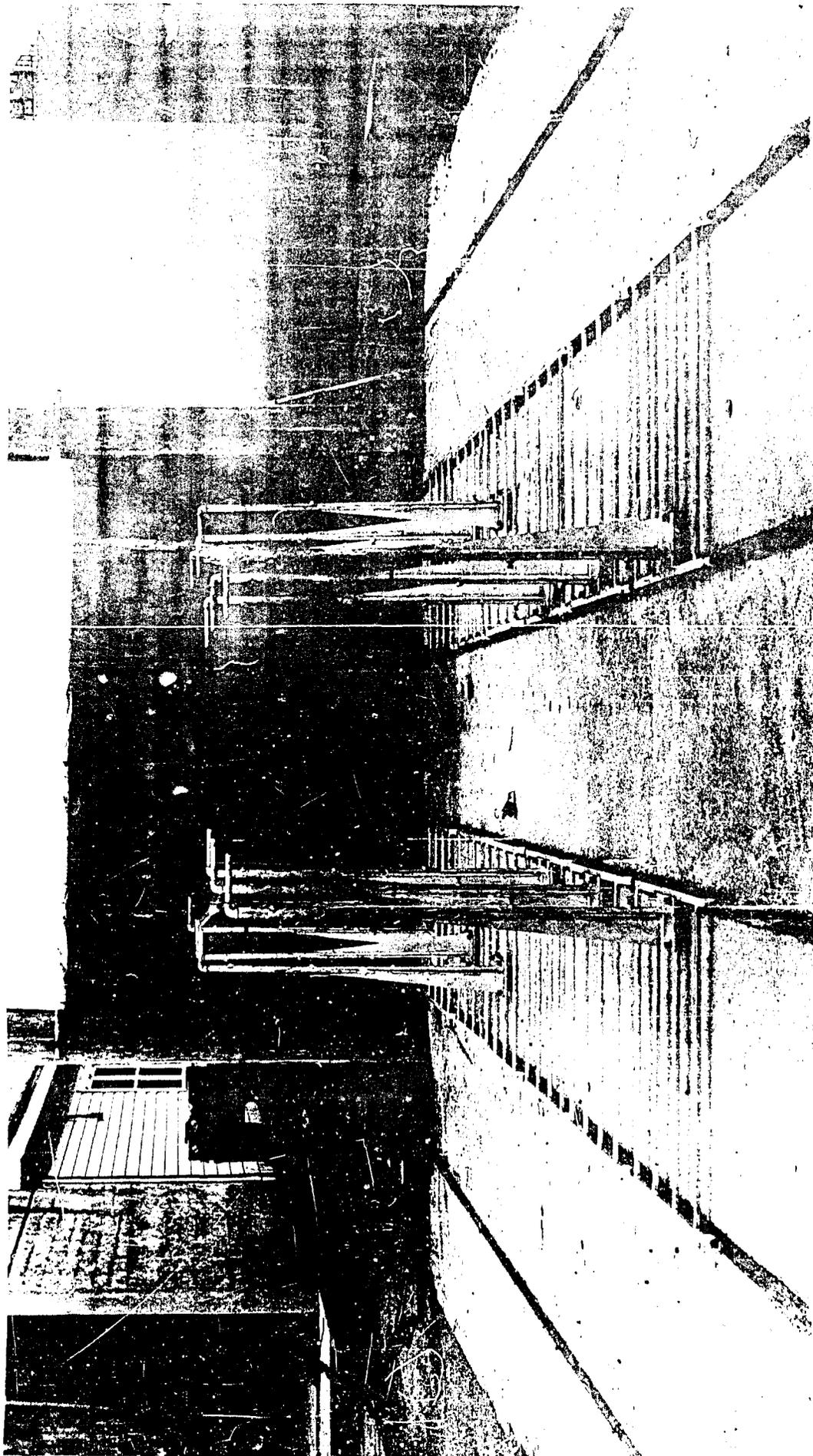


FIGURE 1

Aviation Ordnance Blast Program  
Investigation of Rocket Blast Characteristics

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TABLE IFIRING DATA OF ROCKET MOTORS

<u>Date</u>	<u>Shot No.</u>	<u>Mk.</u>	<u>Mod.</u>	<u>Size</u>	<u>Stabilized</u>
9 November 1948	1	3	1	5"	Spin
9 November 1948	2	3	1	5"	Spin
15 November 1948	3	3	1	5"	Spin
15 November 1948	4	3	1	5"	Spin
15 November 1948	5	3	1	5"	Spin
15 November 1948	6	3	1	5"	Spin
15 November 1948	7	3	1	5"	Spin
15 November 1948	8	3	1	5"	Spin
17 November 1948	9	3	1	5"	Spin
17 November 1948	10	3	1	5"	Spin
17 November 1948	11	3	1	5"	Spin
17 November 1948	12	3	1	5"	Spin
17 November 1948	13	3	1	5"	Spin
17 November 1948	14	3	1	5"	Spin
17 November 1948	15	3	1	5"	Spin
17 November 1948	16	3	1	5"	Spin
17 November 1948	17	3	1	5"	Spin
17 November 1948	18	3	1	5"	Spin
23 November 1948	19	3	1	5"	Spin
23 November 1948	20	3	1	5"	Spin
23 November 1948	21	3	1	5"	Spin
30 November 1948	22	3	1	5"	Spin
30 November 1948	23	3	1	5"	Spin
30 November 1948	24	3	1	5"	Spin
30 November 1948	25	3	1	5"	Spin
30 November 1948	26	3	1	5"	Spin
30 November 1948	27	3	1	5"	Spin
7 December 1948	28	3	1	5"	Spin
7 December 1948	29	3	1	5"	Spin
7 December 1948	30	3	1	5"	Spin
7 December 1948	31	3	1	5"	Spin
7 December 1948	32	3	1	5"	Spin
7 December 1948	33	3	1	5"	Spin

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Investigation of Rocket Blast Characteristics

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TABLE 1 (Cont'd)FIRING DATA OF ROCKET MOTORS

<u>Date</u>	<u>Shot No.</u>	<u>Mk.</u>	<u>Mod.</u>	<u>Size</u>	<u>Stabilized</u>
8 December 1948	34	3	1	5"	Spin
8 December 1948	35	3	1	5"	Spin
8 December 1948	36	3	1	5"	Spin
8 December 1948	37	3	1	5"	Spin
8 December 1948	38	3	1	5"	Spin
8 December 1948	39	3	1	5"	Spin
8 December 1948	40	3	1	5"	Spin
8 December 1948	41	3	1	5"	Spin
8 December 1948	42	3	1	5"	Spin
8 December 1948	43	3	1	5"	Spin
8 December 1948	44	3	1	5"	Spin
8 December 1948	45	3	1	5"	Spin
9 December 1948	46	3	1	5"	Spin
9 December 1948	47	3	1	5"	Spin
9 December 1948	48	3	1	5"	Spin
9 December 1948	49	3	1	5"	Spin
9 December 1948	50	3	1	5"	Spin
9 December 1948	51	3	1	5"	Spin

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L.G. HANSEN (SUBMITTER) 4 FEB '49 11PP. PHOTOS, TABLES

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